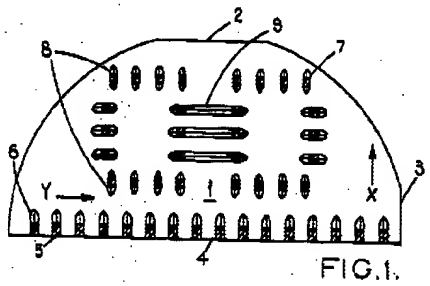

FIG. 1.

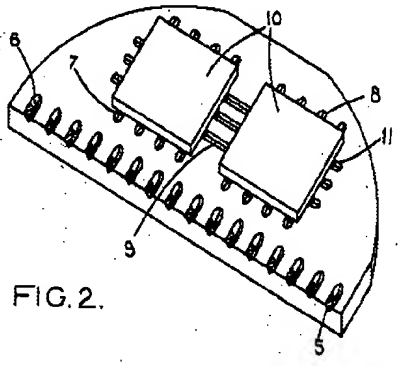

FIG. 2.

US-PAT-NO: 4288808
DOCUMENT-IDENTIFIER: US 4288808 A

TITLE: Circuit structures including integrated circuits

DATE-ISSUED: September 8, 1981

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	RULE 47
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ASSIGNEE INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
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APPL-NO: 6/ 005918
DATE FILED: January 23, 1979

FOREIGN-APPL-PRIORITY-DATA:
FOREIGN-PRIORITY:
FOREIGN-PRIORITY-APPL-NO: GB 03549/78
FOREIGN-PRIORITY-APPL-DATE: January 28,

US005091825A

United States Patent [19]
Hill et al.

[11] **Patent Number: 5,091,825**
[45] **Date of Patent: Feb. 25, 1992**

[54] **ORTHOGONAL BONDING METHOD AND EQUIPMENT**

[75] Inventors: William H. Hill; Dale W. Cawelti, both of Carlsbad, Calif.

[73] Assignee: Hughes Aircraft Company, Los Angeles, Calif.

[21] Appl. No.: 343,756

[22] Filed: Apr. 26, 1989

Related U.S. Application Data

[62] Division of Ser. No. 174,566, Mar. 29, 1988, Pat. No. 4,858,819.

[51] Int. Cl.[5] H01R 9/00
[52] U.S. Cl. 361/404; 357/68; 357/75; 361/405
[58] Field of Search 174/52.4, 253, 260, 174/261; 361/392, 395, 398, 397, 400, 403, 404, 405, 406, 409, 410, 418, 419, 421; 439/68, 69, 74; 357/68, 70, 69, 93; 29/827, 830

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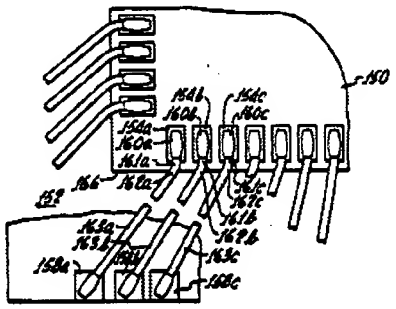
Primary Examiner—Leo P. Picard
Assistant Examiner—Donald A. Sparks
Attorney, Agent, or Firm—Terje Gudmestad; Wanda K. Denson-Low

[57] **ABSTRACT**

Wire bonds are closely spaced about the edge of a semiconductor chip device (150) in an orthogonal array. Even though the wires may have a fan out pattern to their second bond locations, close spacing of the first bond pads is achieved by use of rectangular pads (156) having their long dimensions all perpendicular to the chip edge, making all of the first bonds along lines perpendicular to the chip edge and then bending the wire to extend to the second bond.

3 Claims, 2 Drawing Sheets



US-PAT-NO: 5091825
DOCUMENT-IDENTIFIER: US 5091825 A

TITLE: Orthogonal bonding method and equipment
DATE-ISSUED: February 25, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	RULE 47
Hill; William H.	Carlsbad	CA	N/A	N/A	N/A
Cawelti; Dale W.	Carlsbad	CA	N/A	N/A	N/A

ASSIGNEE INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Hughes Aircraft Company	Los Angeles	CA	N/A	N/A	02

APPL-NO: 7/ 343756
DATE FILED: April 26, 1989

PARENT-CASE:
This is a division of application Ser. No. 174,566, filed Mar. 29, 1988 now U.S. Pat. No. 4,858,819.

INT-CL [5] H01R 9/00

US005173763A

United States Patent [19]
Cipolla et al.

[11] **Patent Number: 5,173,763**
[45] **Date of Patent: Dec. 22, 1992**

[54] **ELECTRONIC PACKAGING WITH VARYING HEIGHT CONNECTORS**

[75] Inventors: Thomas M. Cipolla, Hopewell Junction; Paul W. Coteus, Yorktown Heights; Robert H. Katyl; Robert J. Kelleher, both of Vestal; Paul A. Moskowitz, Yorktown Heights, all of N.Y.

[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

[21] Appl. No.: 634,178

[22] Filed: Feb. 11, 1991

[51] Int. Cl.[5] H01L 21/60; H01L 23/12
[52] U.S. Cl. 257/668; 257/673; 257/735; 257/737; 257/780
[58] Field of Search 357/66, 65, 71, 70, 357/80

[56] References Cited

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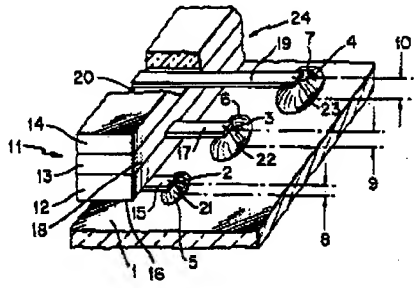
Primary Examiner—Eugene R. Laroche
Assistant Examiner—Viet Q. Nguyen
Attorney, Agent, or Firm—Daniel P. Morris; Alvin J. Rizzuto

[57] **ABSTRACT**

In joining conductors at different levels on a carrier to connect locations on a planar substrate, mound shaped connections are employed, with the height of each mound shaped connection extending to the level of the particular conductor to which it is bonded. The mound shaped connections are formed using planar processes of controlled volume deposition, surface tension shaping on reflow, and physical deformation. The height of the mound shaped connections are calculated empirically from the volume deposited bounded by the substrate pad after surface tension limits the slump on reflowing.

9 Claims, 4 Drawing Sheets



US-PAT-NO: 5173763
DOCUMENT-IDENTIFIER: US 5173763 A

TITLE: Electronic packaging with varying height connectors
DATE-ISSUED: December 22, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	RULE 47
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Katyl; Robert H.	Vestal	NY	N/A	N/A	N/A
Kelleher; Robert J.	Vestal	NY	N/A	N/A	N/A
Moskowitz; Paul A.	Yorktown Heights	NY	N/A	N/A	N/A

ASSIGNEE INFORMATION:

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International Business Machines Corporation	Armonk	NY	N/A	N/A	02

APPL-NO: 7-07-1150